CLAIMS

What is claimed is:

1. A scanning probe microscope tip coated with a layer of chemically-synthesized nanoparticles.

2. The tip of claim 1, wherein said scanning probe microscope tip is one of an atomic force microscope tip, a near-field scanning optical microscope tip, and a scanning tunneling microscope tip.

3. The tip of claim 1, wherein said nanoparticles comprise at least one of an amorphous, crystalline, ferromagnetic, paramagnetic, superparamagnetic, antiferromagnetic, ferrimagnetic, magneto optic, ferroelectric, piezoelectric, superconducting, semiconducting, magnetically-doped semiconducting, insulating, fluorescent, and chemically catalytic nanoparticles.

4. The tip of claim 1, wherein said nanoparticles are coated with an organic layer; wherein said nanoparticles having a diameter ranging from 2 nm to 20 nm, and said organic layer having a thickness ranging from 0.5 nm to 5 nm.

5. The tip of claim 1, wherein said nanoparticles are coated with an organic coat comprising a head-group and a tail-group;

wherein said head group comprises one of an amine, carboxylic acid, isocyanide, nitrile, phosphene, phosphonic acid, sulfonic acid, thiol, and trichlorosilane; and

wherein said tail-group comprises one of an alkyl chain, aryl chain, fluorocarbon, siloxane, fluorophore, DNA, carbohydrate, and protein.

6. The tip of claim 1, wherein said tip is coated with an adhesion layer comprising of one of n-(2-aminoethyl) 3-aminopropyl-trimethoxysilane, polyethylineimine, polymethylmethacrylate, epoxy, cyanoacrylate adhesive, and an α,ω alkyl chain.

7. The tip of claim 1, wherein said layer of chemically-synthesized nanoparticles is at least one nanoparticle thick.

8. The tip of claim 1, wherein said layer of chemically-synthesized nanoparticles is a single layer of nanoparticles thick and covers only the apex of said tip.

9. The tip of claim 1, wherein said layer of chemically-synthesized nanoparticles comprises a single nanoparticle affixed to an apex of said tip.

10. A method of forming a scanning probe microscope tip, said method comprising:

dipping said scanning probe microscope tip into a solution of nanoparticles; and

withdrawing said scanning probe microscope tip from said solution;

wherein said step of dipping causes said nanoparticles to attach to said scanning probe

microscope tip,

wherein said scanning probe microscope tip comprises a tip apex.

11. The method of claim 10, wherein said step of dipping said scanning probe microscope tip into a solution of nanoparticles comprises dipping said scanning probe microscope tip into a monolayer of nanoparticles floating on a liquid subphase.

12. The method of claim 10, wherein said step of dipping said scanning probe microscope tip into a solution of nanoparticles comprises inking an elastomer with a plurality of nanoparticles; and dipping said scanning probe microscope tip into said elastomer.

13. The method of claim 10, further comprising washing off said solution after said step of withdrawing said scanning probe microscope tip from said solution, wherein said solution is a nonvolatile solution.

14. The method of claim 10, further comprising applying an electric potential to said scanning probe microscope tip prior to said step of dipping said scanning probe microscope tip into a solution of nanoparticles.

15. The method of claim 14, wherein said solution further comprises an electrochemical solution, a supporting electrolyte, and an electrode held at a neutral potential.

16. The method of claim 10, wherein said nanoparticles form a layer around said scanning probe microscope tip, wherein said layer is one nanoparticle thick.

17. The method of claim 10, wherein said nanoparticles from a layer around said scanning probe microscope tip, wherein said layer comprises a single layer of nanoparticles and covers only said tip apex.

18. The method of claim 10, wherein only a single nanoparticle is affixed to said tip apex.

19. The method of claim 10, further comprising coating said scanning probe microscope tip with an adhesion promoter prior to said step of dipping said scanning probe microscope tip into a solution of nanoparticles.

20. The method of claim 10, wherein said step of dipping said scanning probe microscope tip into a solution of nanoparticles comprises submerging said tip into said liquid solution.

21. The method of claim 10, wherein said nanoparticles form a layer around said tip, said method further comprising exposing said layer of nanoparticles to one of a laser light, a beam of electrons, ultraviolet light, and heat.

22. The method of claim 10, wherein said nanoparticles form a layer around said tip, said method further comprising transforming said layer of nanoparticles into an electrically continuous film by annealing.

23. The method of claim 10, wherein said nanoparticles form a layer around said tip, said method further comprising orienting uniformly the magnetic axis of said nanoparticles by annealing in the presence of a magnetic field.

24. A method of forming a scanning probe microscope tip, said method comprising:

coating said scanning probe microscope tip, with the exception of an apex of said tip, with a sacrificial layer;

depositing nanoparticles over said tip; and

removing said sacrificial layer.

25. A method of forming a scanning probe microscope tip, said method comprising:

dipping said scanning probe microscope tip into a monolayer of nanoparticles floating on a liquid subphase; and

withdrawing said scanning probe microscope tip from said liquid subphase;

wherein said step of dipping causes said nanoparticles to attach to said scanning probe microscope tip,

wherein said scanning probe microscope tip comprises a tip apex.

26. A method of forming a scanning probe microscope tip, said method comprising:

inking an elastomer with a plurality of nanoparticles;

dipping said scanning probe microscope tip into said elastomer; and

withdrawing said scanning probe microscope tip from said elastomer;

wherein said step of dipping causes said nanoparticles to attach to said scanning probe microscope tip,

wherein said scanning probe microscope tip comprises a tip apex.

27. A method of forming a scanning probe microscope tip, said method comprising:

dipping said scanning probe microscope tip into a liquid solution, wherein said liquid solution is nonvolatile and further comprises a plurality of nanoparticles dispersed therein;

withdrawing said scanning probe microscope tip from said liquid solution; and

washing off said liquid solution, whereby said nanoparticles remain on said scanning probe microscope tip,

wherein said step of dipping causes said nanoparticles to attach to said scanning probe microscope tip,

wherein said scanning probe microscope tip comprises a tip apex.

28. A method of forming a scanning probe microscope tip, said method comprising:

dipping said scanning probe microscope tip into an electrochemical solution, wherein said electrochemical solution comprises nanoparticles, a solvent, and an electrode held at a neutral potential;

applying an electric potential to said scanning probe microscope tip; and

withdrawing said scanning probe microscope tip from said electrochemical solution;

wherein said step of dipping causes said nanoparticles to attach to said scanning probe microscope tip,

wherein said scanning probe microscope tip comprises a tip apex.

29. The method of claim 28, wherein said electrochemical solution further comprises a supporting electrolyte and a reference electrode.